NATURAL COMMUNITIES OF INDIANA

7/1/02 Working Draft

Ellen Jacquart (Indiana Chapter of The Nature Conservancy), Mike Homoya (Department of Natural Resources – Division of Nature Preserves), and Lee Casebere (Department of Natural Resources – Division of Nature Preserves)

INTRODUCTION

This classification system for natural communities in Indiana is intended for use with the Indiana Invasive Plant Species Assessment tool as a means to consistently and accurately identify the natural communities being impacted by invasive species. It is largely based on the Illinois Natural Community Classification System developed by the Illinois Natural Areas Inventory (Illinois Natural Areas Inventory 2002).

INDIANA NATURAL AREAS COMMUNITY CLASSIFICATION SYSTEM

The following classification system, adapted from the Illinois Natural Areas Community Classification, recognizes two main organizational units that are used to identify and describe natural communities within the 12 Natural Regions and their 25 Sections of Indiana (Homoya et al. 1985). The more broad classification unit is the community class, of which 8 are used, and the more specific and fundamental unit is the community type, of which 61 have been identified. This classification does not include any cultural communities, as the purpose of the Invasive Plant Species Assessment is on undisturbed natural areas.

Community Class

A *community class* describes a group of community types that have primary and secondary physiognomic characteristics in common. Primary characteristics include gross hydrology, substrate type, type and structure of vegetative cover. Secondary characteristics include, but are not limited to, topographic position, and soils. The eight community classes recognized by the Inventory are as follows:

I. Forest
II. Savanna
III. Barren
IV. Prairie
V. Wetland
VI. Lake
VII. Stream
VIII. Primary

Community type

A *community type* is a group of populations or species that interrelate directly with each other and their specific environment. A “community type” describes the smallest mutually exclusive unit that is meaningful on a landscape scale. The characteristics used for identifying community types include those general physiognomic characteristics that describe a community class, in addition to soil moisture, soil reaction, vegetative species composition and faunal associations. The Indiana Natural Areas Community Classification System, a list of the natural community classes, natural community types and minimum size requirements is presented in Table 1.

Table 1. Indiana Natural Areas Community Classification System

COMMUNITY CLASS	NATURAL COMMUNITY TYPE	Minimum size requirement
I.Forest	1. Dry upland forest 2. Dry-mesic upland forest 3. Mesic upland forest 4. Mesic floodplain forest 5. Wet-mesic floodplain forest 6. Wet floodplain forest 7. Bluegrass till plain flatwoods 8. Boreal flatwoods 9. Central till plain flatwoods 10. Dry flatwoods 11. Sand flatwoods 12. Southwestern lowland mesic flatwoods	**20.0 acres of contiguous** Grade A, Grade B, or a combination of both.
II.Savanna	13. Mesic savanna 14. Dry sand savanna 15. Dry-mesic sand savanna	**0.25 acre** for loam savannas. **20.0 acres** of Grade A, Grade B or a combination of both of one or more community types for **sand** savanna communities.
III.Barren	16. Limestone bedrock 17. Sandstone bedrock 18. Siltstone bedrock 19. Chert 20. Gravel 21. Sand 22. Clay	**0.25 acre** of Grade A, Grade B or a combination of both of one or more community types.
IV.Prairie	23. Dry-mesic prairie 24. Mesic prairie 25. Wet prairie 26. Dry sand prairie 27. Dry-mesic sand prairie 28. Wet-mesic sand prairie 29. Wet sand prairie	**0.25 acre** of Grade A, Grade B or a combination of both of one or more community types for prairie communities.
V.Wetland	30. Marl beach 31. Acid bog 32. Circumneutral bog 33. Fen 34. Forested fen 35. Muck and sand flat 36. Marsh 37. Sedge meadow 38. Panne 39. Acid seep 40. Calcareous seep 41. Circumneutral seep 42. Forest swamp 43. Shrub swamp	**20.0 acres** of Grade A, B or a combination of both, of one or more community types for **marsh** and **swamp** wetland communities. **0.25 acre** for all other wetland communities.

VI.Lake (natural)	44. Lake (≥21 acres) 45. Pond (1 to 20 acres)	**1.0 acre** **0.25 acre** for ephemeral communities.
VII.Stream	46. Low-Gradient Creek 47. Medium-Gradient Creek 48. High-Gradient Creek 49. Low-Gradient River 50. Medium-Gradient River 51. High-Gradient River 52. Low-Gradient Major River 53. Medium-Gradient Major River	**Streams other than springs require a stream-length of one mile**. The size requirement shall be waived only where the entire length of the stream is less than one mile. **0.25 acre for spring communities**
VIII.Primary	54. Aquatic cave 55. Terrestrial cave 56. Eroding cliff 57. Limestone cliff 58. Overhang cliff 59. Sandstone cliff 60. Lake dune 61. Gravel wash	**0.25 acre** minimum size requirement on either a horizontal or vertical surface.

* Size requirement not applicable.

Soil moisture classes

Soil moisture is a basic characteristic for distinguishing natural communities. Many closely related communities are separated on the basis of soil moisture alone. The following seven *soil moisture classes* are adopted with changes from the soil-drainage classes in the USDA *Soil Survey Manual* (Soil Survey Staff, 1953). The classes are based on runoff, permeability, and internal drainage characteristics.

1) *Xeric* -- Excessively drained: Water is removed from the soil very rapidly, because sloping bedrock or gravel is at or near the surface. A soil profile is commonly poorly developed or absent. Forest soils are commonly brownish, grayish, or reddish and free of mottling. Prairie soils, if developed, have thin A horizons.

2) *Dry* -- Somewhat excessively drained: Water is removed from the soil rapidly. Many of these soils have little horizon differentiation. Forest soils are free of mottling and are brown, yellow, gray, or red. Prairie soils usually have relatively thin A horizons, brownish, yellowish, grayish, or reddish thin B horizons, and no mottling.

3) *Dry-mesic* – Well drained: Water is removed from the soil readily, but not rapidly. Well drained soils are commonly intermediate in texture, although soils of other textural classes may also be well drained. Forest soils are free of mottling (except for fossil gley), and horizons may be brownish, yellowish, grayish, or reddish. They may be mottled deep in the C horizon or below depths of several feet. Prairie soils have thick, dark A horizons, reddish, brownish, or yellowish B horizons, and C horizons that may or may not be mottled. Well drained soils commonly retain optimum amounts of moisture for plant growth after rains.

4) *Mesic* – Moderately well drained: Water is removed from the soil somewhat slowly, so that the profile is wet for a small but significant part of the time. Moderately well drained soils commonly have a slowly permeable layer within or immediately beneath the solum, a relatively high water table, additions of water through seepage, or some combination of these conditions. Forest soils have uniform colors in the A and upper B horizons, with mottling in the lower B and in the C horizons. Prairie soils have thick, dark A horizons and yellowish or grayish faintly mottled B horizons.

5) *Wet-mesic* – Imperfectly or somewhat poorly drained: Water is removed from the soil slowly enough to keep it wet for significant periods but not a large part of the time. They commonly have a slowly permeable layer within the profile, a high water table, additions through seepage, or a combination of these conditions. Forest soils are uniformly grayish, brownish, or yellowish in the upper A horizon and commonly have mottlings below 6 to 16 inches in the lower A and in the B and C horizons. Prairie soils have thick, dark A horizons, high in organic matter, and faint evidences of gleying immediately beneath the A horizon.

6) *Wet* -- Poorly drained: Water is removed so slowly that the soil remains wet for a large part of the time. The water table is commonly at or near the surface during a considerable part of the year. Poorly drained conditions are due to a high water table, to a slowly permeable layer within the profile, to seepage, or to some combination of these conditions. Forest soils may be light gray from the surface downward, with or without mottlings. Prairie soils commonly have slightly thickened dark-colored surface layers. The large quantities of water that remain in an on the poorly drained soils greatly affect the diversity and structure of the plant community.

7) *Hydric* – Very poorly drained: Water is removed from the soil so slowly that the water table remains at or above the surface the greater part of the time. Soils of this drainage class usually occupy level or depressed sites and are frequently ponded. Forest soils commonly have dark gray or black surface layers and are light gray, with or without mottlings, in the deeper parts of the profile. Non-forested soils commonly have mucky or peaty surfaces with distinct evidences of gleying.

DESCRIPTIONS OF COMMUNITY CLASSES AND COMMUNITY TYPES

Descriptions of Community Classes and Community Types

This section describes each community class and its respective community types. Several community classes are so broad that subclasses are noted to facilitate the transition from community class to type. Community type descriptions are brief and include the dominant features and general characteristics. A general statement about geographic distribution is made for each community.

Dominant plant species are listed when there are clear dominants. Other plants are listed as "characteristic" of the community. These species are not synonymous with *indicator-species* because no attempt was made to determine their relationship with the local environment. The order in which the species are listed implies no relative importance.

Some vertebrates and a few invertebrates that characteristically breed in a particular community are listed. However, because the descriptions of topography, soil, water, and vegetation usually define the community well, animals are listed only to present a clearer picture of the community. Few vertebrates

are restricted to a single community, so the animals listed are usually ones with specialized habitats or limited distribution in Indiana.

CLASS I: FOREST

The forest community class includes natural communities that are dominated by trees (canopy >80% cover) with a heavy multiple layered overstory and thick understory. There are three subclasses that are recognized. Upland and floodplain forest are distinguished by their topographic position, and sand forests by their soils.

SUBCLASS

Upland Forest.--The upland forest communities are defined by soil moisture class, which ranges from dry to *wet-mesic*. Upland forests do not normally flood. Forests on terraces are considered upland forests, because (by definition) terraces do not normally flood.

TYPE

1. *Dry upland forest*.--The soils are dry, excessively drained, and poorly developed because of steep, exposed slopes or because of bedrock, gravel, or sand at or near the surface. Trees grow slowly, but are not as stunted as in xeric upland forest, and there usually is a well developed understory and groundlayer. If the canopy is open and savanna plants are present then the community is not a dry upland forest, but is a dry barren: in fact, many dry upland forests of today were most likely maintained as barrens by fire in the past. Distribution: Dry upland forests occur on steep ridges at the crests of river bluffs and at the edges of escarpments throughout Indiana, but are most common on bedrock outcrops in the Shawnee Hills and Highland Rim. Dominant plants: *Quercus prinus* (chestnut oak), *Quercus stellata* (post oak), *Quercus velutina* (black oak). Characteristic plants: *Carya glabra* (pignut hickory), *Dicranum scoparium* (broom moss), *Leucobryum glaucum* (pincushion moss). Characteristic animals: *Scincella laterale* (ground skink), *Eumeces fasciatus* (five-lined skink), *Sceloporus undulatus* (fence lizard), *Piranga rubra* (summer tanager).

2. *Dry-mesic upland forest.*--This community is in an intermediate position along a soil moisture gradient. Trees grow well, but the canopy is usually more open than in mesic forests. Distribution: One of the most prevalent forest communities in Indiana. It occurs on slopes throughout the state. Dominant plants: *Quercus alba* (white oak), *Quercus rubra* (red oak), *Quercus velutina* (black oak). Characteristic plants: *Carya ovata* (shagbark hickory), *Carya tomentosa* (mockernut hickory), *Cornus florida* (flowering dogwood), *Ostrya virginiana* (hop hornbeam), *Viburnum prunifolium* (black haw). Characteristic animals*: Eumeces laticeps* (broad-headed skink), *Peromyscus leucopus* (white-footed mouse), *Tamias striatus* (eastern chipmunk).

3. *Mesic upland forest*.--Ideal soil moisture conditions result in a dense overstory and, in undisturbed stands, an understory of shade-tolerant species. Mesic forests occur on north-facing slopes, in ravines, and on level soil with moderately high available moisture. Distribution: Mesic upland forest may be found throughout the state, but it is most common in hilly regions where slopes are protected from excessive evaporation and from fire. Dominant plants: *Acer saccharum* (sugar maple), *Fagus grandifolia* (beech), *Quercus rubra* (red oak), *Tilia americana* (basswood). Characteristic plants: *Asimina triloba* (pawpaw), *Aesculus glabra* (Ohio buckeye), *Carpinus caroliniana* (blue beech), *Carya cordiformis* (bitternut hickory), *Morus rubra* (red mulberry), *Staphylea trifolia* (bladdernut). Characteristic animals: *Ambystoma tigrinum* (tiger salamander), *Rana sylvatica* (wood frog), *Hylochichla mustelina* (wood thrush).

SUBCLASS

Floodplain forest.--Floodplain forests occur within the floodplains of streams. These dynamic communities are determined by the frequency and duration of flooding, and by the permeability of their soils. Floodplain forests are separated from upland forests because periodic flooding greatly affects the soil, fauna, and flora. The soil moisture classes range from *mesic* to *wet*.

4. *Mesic floodplain forest*.--This community is located within the floodplain, but soils are moderately well drained, because of either their coarse texture or relatively high elevation. Distribution: Mesic floodplain forest occurs throughout Indiana, although the stands are usually not extensive. Dominant plants: *Acer saccharum* (sugar maple), *Quercus alba* (white oak), *Quercus macrocarpa* (bur oak), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Tilia americana* (basswood). Characteristic plants: *Juglans nigra* (black walnut), *Fraxinus americana* (white ash). Characteristic animal: In floodplains, *Scalopus aquaticus* (eastern mole) is generally restricted to mesic soil, especially on natural levees.

5. *Wet-mesic floodplain forest*.--This is the most common floodplain forest community. Species diversity is higher in the overstory, but lower in the groundlayer than in mesic floodplain forest. Distribution: This floodplain community occurs along streams and creeks throughout the state. Dominant plants: The forest is usually a mixture of trees, with no clear dominants. Characteristic plants: *Acer saccharinum* (silver maple), *Celtis occidentalis* (hackberry), *Liquidambar styraciflua* (sweet gum), *Quercus macrocarpa* (bur oak), *Quercus palustris* (pin oak), *Ulmus americana* (American elm), *Lindera benzoin* (spice bush), *Carya laciniosa* (kingnut hickory), *Fraxinus lanceolata* (green ash).

6. *Wet floodplain forest*.--Flooding is so frequent or prolonged in this community that the diversity of trees is lowered and the overstory is more open. The understory is often comprised of large dense stands of *Laportea canadensis* (stinging nettle). Distribution: Wet floodplain forest occurs along streams throughout the state. The most extensive tracts are on lake plains and behind natural levees of large rivers. Dominant plants: Any of the characteristic plant species listed below may be locally dominant. Characteristic plants*: Acer saccharinum* (silver maple), *Populus deltoides* (cottonwood), *Platanus occidentalis* (sycamore), *Acer rubrum* (red maple), *Betula nigra* (river birch), *Salix nigra* (black willow), *Acer negundo* (box-elder).

SUBCLASS

Flatwoods --Flatwoods occur on level or nearly level topography, commonly, but not always underlain by a hardened layer of soil that prevents drainage (hardpan). Flatwoods are slow to drain when flooded, and may be inundated by inches to feet of water for weeks at a time. During dry periods some types of flatwoods become bone-dry because a soil hardpan prevents the replenishment of soil moisture from capillary action. Plants typical of dry or mesic soil grow on slight ridges, and depressions contain ephemeral and seasonal ponding. Canopy cover is typically 50 to 100% and trees have shallow roots. Plants and animals must adapt to both seasonally wet and dry conditions. Many flatwoods had savanna vegetation in presettlement times. Most flatwoods occur on uplands above the floodplain.

7. *Bluegrass till plain flatwoods*. --- Located in the southeastern part of the state, these flatwoods are

typically wet or moist for much of the year. Like other flatwoods, there is usually a mosaic of moisture classes within a relatively small area. Mesic upland forest species dominant the better drained sites, while species more characteristic of floodplain forests occur in the lower portions. Distribution: Mostly in the Muscatatuck Flats and Canyons Section of the Bluegrass Natural Region. Dominant plants: *Quercus alba* (white oak), *Quercus michauxii* (swamp chestnut oak), *Fagus grandifolia* (American beech), *Liquidambar styraciflua* (sweet gum). Characteristic plants: *Panax trifolius* (dwarf ginseng), *Viola blanda* (sweet white violet), *Carex intumescens* (swollen sedge).

8. *Boreal flatwoods*.—These are poorly drained uplands in the Northwestern Morainal Natural Region. Vernal ponds are characteristic. Distribution: Northern flatwoods are known from glacial moraines in the Northwestern Morainal Natural Region. Dominant plants: *Quercus bicolor* (swamp white oak), *Q. palustris* (pin oak), *Acer rubrum* (red maple), *Ulmus americana* (American elm). Characteristic plants: *Betula papyrifera* (white birch), *Ilex verticillata* (winterberry), . Characteristic animal: *Ambystoma laterale* (blue-spotted salamander).

9. *Central Till Plain flatwoods*. – Flatwoods confined to the Central Till Plain Natural Region are identified here. They are primarily composed of mesic upland forest species with wetland species typically associated with shallow swamp environments. Distribution: Confined to the Central Till Plain Natural Region. Dominant plants: *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), *Liriodendron tulipifera* (tulip tree), *Quercus shumardii* (shumard oak), and *Quercus bicolor* (swamp white oak). Characteristic plants: *Carex woodii* (pretty sedge) and *Actaea pachypoda* (baneberry).

10. *Dry flatwoods*.-- This community is found on level areas with a well developed heavy clay hardpan; an almost impermeable layer of fine-textured, hardened clay particles, usually on a lacustrine plain of Illinoian age. The unfavorable soil conditions commonly cause stunted trees. Distribution: This community occurs in the Driftless section of the Southwestern Lowlands Natural Region. Dominant plants: *Quercus stellata* (post oak), *Quercus marilandica* (blackjack oak), *Quercus alba* (white oak), *Quercus palustris* (pin oak), and *Quercus bicolor* (swamp white oak), the latter two occurring in shallow swales. Characteristic plants: *Danthonia spicata* (poverty grass), *Crotonopsis elliptica* (rushfoil).

11. *Sand flatwoods*.-- This community develops on soils with two distinct layers: 3 feet or more of acid, peaty sand over clay. Where natural firebreaks occur, sand flatwoods are present rather than shrub prairie or wet-mesic sand prairie. In the absence of fire,these prairie communities can succeed to sand flatwoods. Distribution: Sand flatwoods are restricted to sandy plains in northern Indiana. Dominant plants: *Quercus palustris* (pin oak), *Quercus alba* (white oak), *Nyssa sylvatica* (black gum), *Acer rubrum* (red maple). Characteristic plants: *Ilex verticillata* (winterberry), *Maianthemum canadense* (false lily-of-the-valley), *Mitchella repens* (partridge-berry), O*smunda cinnamomea* (cinnamon fern), *Vaccinium angustifolium* (low-bush blueberry).

12. *Southwestern Lowland flatwoods.* – These are located in the same general area as the dry flatwoods, but consist of soils that provide for less harsh growing conditions. Diversity is greater than in the dry flatwoods, and prairie species are present in good examples. Distribution: Driftless Section of the Southwestern Lowlands Natural Region. Dominant plants: *Quercus pagoda* (cherrybark oak), *Quercus stellata* (post oak), and *Carya ovata* (shagbark hickory). Characteristic plants: *Spigelia*

marilandica (Indian pink), *Isoetes melanopoda* (black quillwort).

CLASS II: SAVANNA

Savanna communities are characterized by widely spaced trees and an understory of native grasses, forbs, sedges, and shrubs that require high levels of light. Savannas are similar to barrens communities in form but barrens almost always occur on thin, poor excessively drained soils. Savannas can occur on poor to rich soils transitional between forest and prairie soils. Savannas have distinctive plants and animals and were once among the most widespread and characteristic communities in Indiana. Fire suppression has allowed the remaining rich soil savannas to succeed to closed forest communities. Today the least-degraded savanna remnants occur on sandy soils that still burn frequently, and on the very driest slopes where woody encroachment has been slowest.

TYPE

13. *Mesic savanna* – The moisture level in mesic savannas is the same as in mesic prairie, and the herbaceous vegetation is similar to mesic prairie. This community is found at the base of morainic ridges and (rarely) as islands in wetland vegetation. Dominant plants: *Quercus alba* (white oak), *Quercus macrocarpa* (bur oak), *Andropogon gerardii* (big bluestem), *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indian grass). Characteristic plants: *Heliopsis helianthoides* (false sunflower), *Lathyrum venosus* (veiny pea), *Zizia aurea* (golden alexanders).

14. *Dry sand savanna* -- The crests of the highest dunes support this community. There is little or no A horizon. Grasses are shorter than 3 feet, and plant species diversity is low. Distribution: This community occurs in the major sand regions of Indiana. Dominant plants: *Schizachyrium scoparium* (little bluestem), *Calamovilfa longifolia* (sand reed grass), *Carex pensylvanica* (sedge), *Koeleria macrantha* (June grass), *Quercus velutina* (black oak), *Stipa spartea* (porcupine grass). Characteristic plants: *Commelina erecta* (day flower), *Monarda punctata* (horsemint), *Phlox bifida* (cleft phlox).

15. *Dry-mesic sand savanna*.--There is some development of an A horizon in this community, because it has a lower topographic position than the preceding community or because it occurs on north-facing or east-facing dune slopes. Distribution: Dry-mesic sand savanna may occur in the same area as dry sand savanna. Dominant plants: *Schizachyrium scoparium* (little bluestem), *Carex pensylvanica* (sedge), *Quercus velutina* (black oak), *Sorghastrum nutans* (Indian grass), *Stipa spartea* (porcupine grass). Characteristic plants: *Aster linariifolius* (flax-leaved aster), *Ceanothus americanus* (New Jersey tea), *Gerardiia pedicularia* (clammy false foxglove), *Lupinus perennis* (wild lupine), *Salix humilis* (prairie willow), *Vaccinium angustifolium* (low-bush blueberry).

CLASS III: BARRENS

A barrens community is characterized by poor, thin or excessively drained soils over bedrock, or sand, or other substrates experiencing extreme drought during at least a portion of every year. Trees growing on barrens often have a stunted or gnarled growth form because the soils contain little moisture or plant nutrients.

TYPE

16-18. *Bedrock barrens* -- Bedrock barrens communities are harsh, droughty environments over bedrock or on excessively drained slopes. The tree layer has stunted xerophytic oaks, and commonly sparse vegetation. Bedrock typically consisting of limestone, but siltstone, and sandstone examples exist.

These are sometimes referred to as glades. Distribution: Dry barrens occur in southern and western portions of the state on dry ridges along streams on south and southwest facing slopes. They are mostly present in the Shawnee Hills and Highland Rim Natural Regions. Dominant plants: *Schizachyrium scoparium* (little bluestem), *Danthonia spicata* (curly grass), *Quercus marilandica* (blackjack oak), *Quercus stellata* (post oak), *Quercus velutina* (black oak), *Vaccinium arboreum* (farkleberry). Characteristic plants: *Scleria oligantha* (nutrush) , *Liatris squarrosa* (rough blazing-star).

19. *Chert barrens* – These are barrens that occurred formerly over many square miles in the karst plain of the Highland Rim Natural Region. Chert fragments are common in the substrate of a landscape that typically consists of numerous sinkholes. Grassland and oak groves characterized the presettlement condition. Distribution: Confined to the Mitchell Karst Plain Section of the Highland Rim Natural Region. Dominant plants: *Sorghastrum nutans* (Indian grass), *Schizachyrium scoparium* (little bluestem), *Quercus stellata* (post oak). Characteristic plants: *Silphium terebinthinaceum* (prairie dock), *Ceanothus americanus* (New Jersey tea).

20. *Gravel barrens* – Gravel barrens occur on steep slopes where there are localized deposits of glacial outwash and sand. Distribution: Very local within the area of Wisconsinan glaciation in the northern half of Indiana. Dominant plants: *Schizachyrium scoparium* (little bluestem), *Bouteloua curtipendula* (side-oats grama), *Muhlenbergia cuspidata* (plains muhly). Characteristic plants: *Lithospermum incisum* (fringed puccoon), *Bessya bullii* (kittentails), *Erysimum asperum* (western wallflower).

21. *Sand barrens* – Deep deposits of windblown sand, often in the form of dunes, characterize the substrate of sand barrens. Distribution: Mostly in the western, particularly northwestern part of the state (Kankakee Sand Section of the Grand Prairie Natural Region). Dominant plants: *Schizachyrium scoparium* (little bluestem), *Carex pensylvanica* (sedge), *Quercus velutina* (black oak). Characteristic plants: *Pteridium aquilinum* (bracken fern), *Talinum rugospermum* (fame flower), *Linaria canadensis* (blue toadflax).

22. *Clay barrens* – Clay barrens occur in areas with a dense, relatively impervious clay layer of soil at or just below the surface. It impedes percolation and subsoil recharge, resulting in droughty conditions. Distribution: Occurs predominantly in the far southwestern portion of the state. Dominant plants: *Quercus stellata* (post oak), *Danthonia spicata* (poverty grass). Characteristic plants: *Trifolium reflexum* (buffalo clover), *Crotonopsis elliptica* (rushfoil).

CLASS IV: PRAIRIE

The prairie community class includes community types that are dominated by native grasses, forbs and shrubs on mineral soil. Six subclasses are recognized: black soil prairie, sand prairie, gravel prairie, dolomite prairie, hill prairie, and shrub prairie.

SUBCLASS

Prairie.--This subclass includes typical "black-soil" prairies. Soils are deep and fine-textured, usually silt loam or clay loam derived from loess or glacial till, although the prairies may also occur on alluvium. Prairie communities in some other subclasses (for example, *mesic sand prairie*) may also have soils with deep, dark A horizons, so the term *black soil* is not applicable solely to this subclass. Soil moisture for these prairies ranges from *dry-mesic* to *wet*.

TYPE

23. *Dry-mesic prairie* -- Moisture levels are intermediate between dry and mesic. Grass height approaches that of mesic prairie, and diversity is greater than in dry prairie. Distribution: This community occurs throughout the prairie regions. Dominant plants: *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indian grass), *Stipa spartea* (porcupine grass). Characteristic plants: *Amorpha canescens* (leadplant), *Echinacea pallida* (pale coneflower), *Liatris aspera* (rough blazing-star), *Potentilla arguta* (prairie cinquefoil).

24. *Mesic prairie* -- Favorable moisture conditions allow for maximum plant species diversity and maximum grass and forb height. The grass layer may be only 3 feet tall if *Sporobolus heterolepis* (prairie dropseed) dominates, but it is sometimes 6 feet tall. Distribution: Mesic prairie was one of the most widespread and characteristic communities in northwestern Indiana. Dominant plants: *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indian grass), *Sporobolus heterolepis* (prairie dropseed). Characteristic plants: *Baptisia leucophaea* (cream wild indigo), *Dodecatheon meadii* (shooting-star), *Eryngium yuccifolium* (rattlesnake master), *Liatris pycnostachya* (prairie blazing-star), *Lithospermum canescens* (hoary puccoon), *Petalostemum candidum* (white prairie clover), *Phlox pilosa* (downy phlox), *Silphium laciniatum* (compass-plant), *Silphium terebinthinaceum* (prairie-dock).

25. *Wet prairie* – Standing water is present on the surface during winter and spring, and the soil is nearly always saturated. Plant species diversity is lower than in other prairie communities. Distribution: Wet prairie was generally distributed throughout the prairie regions of Indiana. Dominant plants: *Calamagrostis canadensis* (bluejoint grass), *Carex* spp. (sedges), *Spartina pectinata* (cord grass). Characteristic plants: *Cacalia tuberosa* (prairie Indian-plantain), *Eupatorium perfoliatum* (common boneset), *Iris shrevei* (wild blue iris), *Lythrum alatum* (winged loosestrife), *Sium suave* (water parsnip).

SUBCLASS

Sand prairie -- Soils in this subclass are coarse-textured: either sand, loamy sand, and sandy loam can support sand prairie. However, prairies on sandy loam are considered sand prairies only if they are acidic enough to have characteristic plants. Sand prairies are found on sandy outwash plains, lake plains, and valley trains. The soil moisture varies from *dry* to *wet*.

TYPE

26. *Dry sand prairie* -- The soil lacks a dark A horizon, and grass is less than 3 feet tall. Dry sand prairies are rather rare because the proper topographic position for dry sand usually also reduces fire severity enough to allow a savanna to develop. Distribution: This community occurs on the crests of sand dunes. Dominant plants: *Schizachyrium scoparium* (little bluestem), *Calamovilfa longifolia* (sand reed), *Koeleria macrantha* (June grass), *Stipa spartea* (porcupine grass). Characteristic plants: *Arenaria stricta* (stiff sandwort), *Monarda punctata* (horsemint), *Opuntia compressa* (prickly-pear cactus).

27. *Dry-mesic sand prairie* -- This community has a dark A horizon, unlike the preceding community. The average height of grass and the species diversity approach that of mesic sand prairie. Distribution: Dry-mesic sand prairie may occur with any other sand prairie communities. Dominant

plants: *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indian grass), *Stipa spartea* (porcupine grass). Characteristic plants: *Aster linariifolius* (flax-leaved aster), *Liatris aspera* (rough blazing-star), *Solidago speciosa* (showy goldenrod), *Viola pedata* (birdfoot violet).

28. *Wet-mesic sand prairie* – Standing water pools on the surface for short periods and a deep, acid, dark A horizon is present. The mixture of grasses is transitional between mesic sand prairie and wet sand prairie. Distribution: Small areas of wet-mesic sand prairie are commonly associated with mesic sand prairie. Dominant plants: *Andropogon gerardii* (big bluestem), *Calamagrostis canadensis* (bluejoint grass), *Carex* spp. (sedges), *Sorghastrum nutans* (Indian grass), *Spartina pectinata* (cord grass). Characteristic plants: *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Pycnanthemum virginianum* (common mountain mint), *Rhexia virginica* (meadow beauty), *Viola lanceolata* (lance-leaved violet), *Xyris torta* (yellow-eyed grass).

29. *Wet sand prairie*.–Standing water pools on the surface for as much as one-third of the year. Wet sand prairie is floristically very similar to wet prairie. Dominant plants: *Calamagrostis canadensis* (bluejoint grass), *Carex* spp. (sedges), *Spartina pectinata* (cord grass), *Thelypteris palustris* (marsh fern).

CLASS V: WETLAND

The wetland community class includes natural communities that are transitions between aquatic and upland ecosystems that contain permanent standing water, seasonal standing water or have saturated hydric soils with a vegetative cover. The sub-classes (marl beach, bog, fen, flat, marsh, sedge meadow, panne, seep, and swamp) are recognized mainly by differences in the vegetation caused by soil ph, water depth and water movement.

SUBCLASS

Marl beach - Similar to fens with two major differences: 1) develop on raw marl on shores of lakes where there is no or little peat accumulation, and 2) unlike fens which are ground water fed, these are under the influence of the water table associated with rising and falling lake levels; depending on water levels, may be wet with an inch or two of water or bone dry.

TYPE

30. *Marl beach* – Located in northeastern part of the state. Plant species composition is similar to fens, but less diverse. They contain many calciphilic and prairie species. Distribution: Northern Lakes Natural Region. Dominant plants: *Potentilla fruticosa* (shrubby cinquefoil), *Sorghastrum nutans* (Indian grass), *Cladium mariscoides* (twig rush), *Scirpus pungens* (chairmaker's rush), *Scirpus acutus* (hard-stemmed bulrush). Characteristic plants: *Solidago ohiensis* (Ohio goldenrod), *Parnassia glauca* (grass of Parnassus), *Liatris spicata* (marsh blazing star), *Lysimachia quadriflora* (narrow-leaved loosestrife), *Eleocharis rostellata* (wicket spike rush), *Carex cryptolepis* (small yellow sedge).

SUBCLASS

Bog – Low-nutrient, acid (at least in the uppermost layer) peat deposits support a variety of bog communities. Bogs are nearly always in glacial depressions, and drainage is usually restricted. Bogs are often characterized by a "moat" along the periphery. This zone of open water, marsh, sedge meadow, or fen may be caused by a combination of fire and calcareous seepage from the mineral-rich till. A layer of *Sphagnum* sp. (sphagnum moss) usually associated with *Polytrichum* sp. (hairy-cap moss) characterizes nearly all bog communities. Most are restricted to the Northern

Lakes and Northwestern Morainal Natural Regions.

31. *Acid bog* – Acid bogs are typically those that occur in basins where precipitation is the primary source of water input. Sphagnum moss composes a floating mat upon which acid-loving plants occur. Dominant plants: *Sphagnum* spp. (Sphagnum moss), *Chamaedaphne calyculata* (leatherleaf), *Rhus toxicodendron* (poison sumac), *Woodwardia virginica* (Virginia chain fern). Characteristic plants*: Vaccinium macrocarpon* (cranberry), *Carex oligosperma* (sedge), *Andromeda glaucophylla* (bog rosemary), *Sarracenia purpurea* (pitcherplant).

32. *Circumneutral bog* -- This community exists on fairly well consolidated peat. Hummocks (which tend to be more acid) and small, wet depressions are characteristic. This category includes both forested bogs with a markedly acid upper peat horizon as well as open areas with only scattered areas of acidity. The latter have been termed "half-bogs" or "forested fens" by some ecologists. Dominant plants: *Ilex verticillata* (winterberry), *Larix laricina* (tamarack), *Carex lasiocarpa* (sedge), *Toxicodendron vernix* (poison sumac). Characteristic plants: *Cypripedium acaule* (lady's-slipper orchid), *Lycopodium lucidulum* (shining clubmoss), *Osmunda cinnamomea* (cinnamon fern), *Trientalis borealis* (star-flower), *Vaccinium corymbosum* (high-bush blueberry), *Sphagnum* spp. (sphagnum moss), *Betula lutea* (yellow birch).

SUBCLASS

Fen – Peat with calcareous groundwater seepage is necessary for all fen communities. Most fen communities tend to have a rather pronounced slope. They are most closely correlated with calcareous (especially gravelly) moraines and occur in both lake basins and stream valleys. Fens are often found in association with strongly calcareous spring runs as well as such natural communities as calcareous seeps, sedge meadows, and marshes. The fen communities are restricted mostly to the northern half of Indiana.

TYPE

33. *Fen*.--Sloping peat is either at the edge of a moraine or, more rarely, is a raised island in a marsh or sedge meadow. In the latter case, this has been attributed to upwelling of groundwater. Dominants are either mesophytic native grasses in the most elevated peat or sod-forming sedges (but never tussock-forming sedges). Although the peat is quite elevated, it resists decay due to the high level of calcium and magnesium carbonate. Dominant plants: *Andropogon gerardii* (big bluestem), *Schizachyrium scoparium* (little bluestem), *Carex sterilis* (sedge), *Sorghastrum nutans* (Indian grass), *Sporobolus heterolepis* (prairie dropseed). Characteristic plants: *Carex hystricina* (sedge), *Liatris spicata* (rough blazing-star), *Lobelia kalmii* (Kalm's lobelia), *Lysimachia quadriflora* (loosestrife), *Muhlenbergia glomerata* (muhly grass), *Parnassia glauca* (grass-of-Parnassus), *Solidago ohioensis* (Ohio goldenrod), *Sarracenia purpurea* (pitcher-plant).

34. *Forested fen* -- This community is on relatively steep slopes in peat, and the tree cover is greater than 20%. Natural firebreaks (as in shrub fens) are probably necessary for development of this community. Dominant plants: *Larix laricina* (tamarack), *Thuja occidentalis* (white cedar). Characteristic plants: *Conioselinum chinense* (hemlock parsley), *Geum rivale* (purple avens), *Platanthera hyperborea* (green orchid), *Symplocarpus foetidus* (skunk cabbage).

SUBCLASS

Flat - These level, acidic communities are typically saturated and at times inundated, especially during the winter and early spring months.

TYPE

35. Muck and Sand Flats: Wet expanses of sand and muck commonly harbor many of the same species, so they are combined here for the purposes of this document. They are typically associated with shallow ephemeral pools or shorelines of ponds or natural lakes. Those with muck substrates may float if sufficient water is present. At some sites, plants of Eastern Coastal Plain affinities are associated with the types. Distribution: These communities occur mostly in the Northern Lakes, Northwestern Morainal, and Grand Prairie natural regions. Dominant Plants: Rhynchospora capitellata (beak-rush), Calamagrostis canadensis (blue joint grass), Dulichium arundinaceum (three-way sedge). Characteristic plants: Psilocarya scirpoides (bald rush), Eleocharis melanocarpa (black-fruited spike rush), Rhexia virginica (meadow beauty), Fuirena pumila (umbrella sedge), Eriocaulon aquaticum (pipewort).

SUBCLASS

Marsh – Tall graminoid persistent or non-persistent plants dominate marsh communities, which have water near or above the surface for most of the year. Soils may be peat, muck, or mineral.

TYPE

36. *Marsh* -- This class includes fresh-water communities in glacial depressions, on lake plains and in stream valleys. Marshes have a wide variety of plant communities. In general, the deeper the water, the lower the plant species diversity. Fluctuations in water levels, fire frequency, and *Ondatra zibethicus* (muskrat) population cycles are also important in determining species composition and structure. Distribution: Once very widespread, natural marshes are now common only in the Northern Lakes Natural Region. Dominant plants: *Carex lacustris* (sedge), *Decodon verticillatus* (swamp loosestrife), *Phragmites communis* (reed), *Polygonum amphibium* (water smartweed); *Polygonum coccineum* (water smartweed), *Scirpus fluviatilis* (bulrush), *Scirpus validus* (bulrush), *Typha angustifolia* (narrow-leaved cat-tail) *Typha latifolia* (common cat-tail). Characteristic plants: *Alisma* spp. (water plantains), *Boltonia asteroides* (false aster), *Proserpinaca palustris* (mermaid-weed), *Sagittaria latifolia* (common arrowleaf), *Scutellaria epilobiifolia* (marsh skullcap).

SUBCLASS

Sedge meadow -- A sedge meadow is a wetland dominated by sedges *(Carex)* on peat, muck, or wet sand. The sedge meadow is remarkably homogenous in composition and structure. Hummocks are indicative of this community.

TYPE

37. *Sedge meadow* -- The soil moisture level is analogous to that of wet prairie, and there is some degree of floristic overlap between the two communities. *Carex stricta* (sedge) is the major dominant. Dominant plants: *Carex lacustris* (sedge), *Calamagrostis canadensis* (bluejoint grass), *Carex lasiocarpa* (sedge), *Carex stricta* (sedge). Characteristic plants: *Aster puniceus var. lucidulus* (swamp aster), *Chelone glabra* (white turtlehead), *Epilobium leptophyllum* (bog willow herb), *Eupatorium maculatum* (spotted Joe-Pye weed), *Triadenum virginicum* (marsh St. Johns-wort).

SUBCLASS

Panne – This community type is restricted to wet and wet-mesic swales in calcareous sand or what is left of ancient beach ridges or dune and swale topography within one mile of Lake Michigan.

TYPE

38. *Panne* – This community has considerable floristic overlap with the graminoid fen and the calcareous seep. Competition is not as intense as in fens, because a panne's sod is not dense. Dominant plants: *Calamagrostis canadensis* (bluejoint grass), *Carex* spp. (sedges), *Cladium mariscoides* (twig rush), *Juncus balticus* var. *littoralis* (rush), *Potentilla fruticosa* (shrubby cinquefoil). Characteristic plants: *Carex viridula* (sedge), *Eleocharis olivacea* (spike rush), *Linum medium* var. *texanum* (wild flax), *Triglochin maritima* (arrow-grass), *Triglochin palustris* (arrow-grass), *Utricularia cornuta* (horned bladderwort).

SUBCLASS

Seep – This community occurs where groundwater flows to the surface. A *seep* is an area with saturated soil caused by water flowing to the surface in a diffuse rather than concentrated flow. Seeps may have local areas of concentrated flow, and the water usually collects in spring runs. Seeps are usually smaller than 0.1 acre, and are most common along the lower slopes of glacial moraines, ravines, and terraces. A *spring*, as opposed to a *seep*, has a concentrated flow of groundwater from a definite orifice. The various communities in this subclass are separated on the basis of substrate and water characteristics.

TYPE

39. *Acid seep*.--This community has muck or peat deposits and a low pH. Distribution: Acid seeps are restricted to a few small areas in the southern half of the state. Dominant plants: *Acer rubrum* (red maple), *Alnus serrulata* (smooth alder), *Aronia melanocarpa* (black chokeberry). Characteristic plants: *Athyrium filix-femina* (lady fern), *Carex atlantica* (sedge), *Carex bromoides* (sedge), *Polygonum arifolium* (tearthumb), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Sphagnum* spp. (sphagnum mosses)

40. *Calcareous seep*.--Groundwater is so highly calcareous that tufa deposits form on the surface. Many typical seeps are somewhat calcareous; but the distinction is drawn when tufa is present, forest cover is absent, and peat deposits (usually) adjoin the seep. Calcareous seeps usually occur in close association with various fen communities. There is some floristic overlap with fens as well as with the panne. Distribution: Calcareous seeps are nearly restricted to the Wisconsinan till plain. Characteristic plants: *Cladium mariscoides* (twig rush), *Deschampsia caespitosa* (tufted hairgrass),*Eleocharis rostellata* (spike rush), *Juncus brachycephalus* (rush), *Potentilla fruticosa* (shrubby cinquefoil), *Rhynchospora capillacea* (beaked rush), *Rhynchospora alba* (beaked rush), *Scirpus caespitosus* (bulrush), *Scleria verticillata* (nut rush), *Silphium terebinthinaceum* (prairie-dock), *Tofieldia glutinosa* (false asphodel), *Triglochin palustris* (arrow-grass).

41. *Circumneutral Seep* -- This is the typical, common seep community with circumneutral water. A tree cover is often present. Distribution: Seeps occur mostly in the central and northern parts of the state, although many are commonly too small to recognize as significant communities. Dominant plants: *Carex* spp. (sedges), *Fraxinus nigra* (black ash), *Symplocarpus foetidus* (skunk cabbage), *Glyceria striata* (fowl manna grass), *Impatiens biflora* (spotted touch-me-not), *Pilea pumila* (clearweed). Characteristic plants: *Angelica atropurpurea* (angelica), *Caltha palustris* (marsh marigold), *Filipendula rubra* (queen of the prairie), *Pedicularis lanceolata* (swamp wood betony), *Chelone glabra* (white turtlehead), *Solidago patula* (spreading goldenrod), *Epilobium coloratum* (cinnamon willow herb).

SUBCLASS

Swamp.--A swamp is a wetland dominated by woody plants. Two communities are recognized on the basis of vegetation structure.

TYPE

42. *Forest swamp*.--A forest swamp is a forested, permanent or semi-permanent body of water. Distribution: Swamps are limited to extreme southern Indiana, because only southern tree species can live in permanent standing water. A variant of this type, the sinkhole swamp, is restricted to the karst plain of the Highland Rim and Shawnee Hills Natural Regions. Dominant plants: *Taxodium distichum* (bald cypress), *Cephalanthus occidentalis* (buttonbush). Characteristic plants: *Populus heterophylla* (swamp cottonwood), *Fraxinus tomentosa* (pumpkin ash), *Rosa palustris* (swamp rose).

43. *Shrub swamp*.--A shrub swamp has a 50% or greater coverage by shrubs. A shrub swamp has less than 20% tree cover, or else it is classified simply as a swamp. Shrub swamps are often associated with ponds in wet floodplain forest communities. Occasionally, shrub swamps occur in glacial potholes, where they grade into the tall shrub bog community. Distribution: Shrub swamps are generally distributed throughout the state. Dominant plants: *Cephalanthus occidentalis* (buttonbush)

CLASS VI: LAKE

Open waters are permanent, open bodies of water 0.1 acre or larger. They are separated from wetlands by their permanence and by their general lack of emergent woody or graminoid vegetation.

TYPE

44. *Lake* – These bodies of water measure 20 acres or larger were formed by glacial action thousands of years ago. In Indiana, most glacial lakes are found in the northeastern part of the state. Many of these have been recently altered by man including septic tank drainage from homes, raising water levels with berms, and stocking various fish species. Characteristic plants: *Nuphar* spp. (pond lily), *Potamogeton* spp. (pondweeds), *Lemna* spp. (duckweed), *Polygonum* spp. (smartweeds).

45. *Pond* – These natural bodies of water measure 0.1 to 20 acres or larger. Many are of glacial origin, or occur as oxbows in abandoned channels of streams and rivers. They are found throughout the state, but are more prevalent in the Northern Lakes Natural Region. A variant is the sinkhole pond; see 42. Forest Swamp above.

CLASS VII: STREAM

A stream is a body of water flowing in a channel or water course such as a river or creek.. Although stream communities may inter-grade, four community classes are recognized on the basis of size: creek small stream, large stream, major river.

SUBCLASS

Creek.--A creek is defined as a perennial stream or stream segment with an average width of 20 feet or less. Three creek communities are identified on the basis of their gradients.

TYPE

46. *Low-gradient creek*.--A low-gradient creek has a gradient of less than 1 foot per mile. The current is sluggish, there are few if any riffles, and the primary bottom sediments are usually silt and organic matter. This community is characteristic of flat prairie uplands and bottomlands. Characteristic animals: *Erimyzon oblongus* (creek chubsucker), *Ictalurus natalis* (yellow bullhead), *Etheostoma gracile* (slough darter), *Semotilus atromaculatus* (creek chub), *Notropis umbratilis* (redfin shiner).

47. *Medium-gradient creek*.--A medium-gradient creek has a fall of between 1 and 10 feet per mile. Since these creeks have a slower current than high gradient creeks, they usually have a greater amount of silt deposited in the stream bottom. Medium-gradient creeks are generally distributed throughout Indiana. Characteristic animals: *Lepomis megalotis* (longear sunfish), *Nocomis biguttatus* (hornyhead chub), *Notropis lutrensis* (red shiner), *Phenacobius mirabilis* (suckermouth minnow).

48. *High-gradient creek*.--This is a creek with a gradient of 10 or more feet per mile. Riffles, pools, and sand and gravel beds are characteristic of high gradient creeks. Headwater streams throughout much of Indiana are classified as high-gradient creeks. Characteristic animals: *Cottus carolinae* (banded sculpin), *Fundulus olivaceus* (blackspotted topminnow), *Campostoma anomalum* (common stoneroller), *Phoxinus erythrogaster* (southern redbelly dace), *Rana palustris* (pickerel frog).

SUBCLASS

River.--A river is defined as a perennial stream or stream segment with an average width between 21 and 300 feet. Anything larger than that is considered a major river. Three river communities are identified on the basis of their gradients.

TYPE

49. *Low-gradient river*.--These small rivers have a gradient of less than 1 foot per mile. The current is sluggish, there are few if any riffles, and the bottom sediments are primarily silt and organic matter. This community type can be found on segments of some small rivers flowing across flat prairie uplands or across flat floodplains of receiving streams. Examples include the Patoka River.

50. *Medium-gradient river*.--This small river community has a gradient of between 1 and 10 feet per mile. Since the current is slower than high-gradient small rivers, the bottom sediments usually include a little more silt. Examples of this type of community include major sections of the Pigeon River.

51. *High-gradient river*.--This is a small river with a gradient of 10 or more feet per mile. Characteristics include pools, riffles, and sand and gravel beds. Examples of this community type can be found on sections of the Blue River and Sugar Creek.

SUBCLASS

Major river.--A major river is defined as a stream or stream segment with an average width greater than 300 feet.

TYPE

52. *Low-gradient large river*.--The gradient of this community is less than 1 foot per mile. The channel is meandering, deep, and the current is sluggish. There may be sandbars, but the sediments are mainly silt. The low-gradient large rivers in Indiana include the Ohio and Wabash Rivers.

53. *Medium-gradient large river*.--This large river community has a gradient of between 1 and 10 feet per mile. Characteristics include some riffles, sand and gravel beds, and some silt deposits. Examples of this community type in Indiana include the East and West Forks of the White River.

CLASS VIII: Primary

Communities that are established where soil is thin or absent, and the parent material is at or near the surface.

SUBCLASS

Cave – A cave is a naturally occurring void in earth materials that is humanly penetrable for at least 20 feet. This includes solution features, collapse features, or crevices. Solution caves form in limestone or dolomite and there is no significant difference between caves formed in the two kinds of rocks. Small caves form in sandstone. The longest cave systems are in the Escarpment Section of the Shawnee Hills Natural Region, but caves are also common in the Mitchell Karst Plain Section of the Highland Rim Natural Region and in the Bluegrass Natural Region. Two cave communities are distinguished: the terrestrial cave community and aquatic cave community. Within each community, there are recognized four groups of species: 1) accidentals: species that do not normally inhabit caves; 2) trogloxene: cave "visitor" that leaves the cave to feed or reproduce; 3) troglophile: facultative cave dweller that may live and reproduce in caves; and 4) troglobites: an obligate cave dweller that lives and reproduces only in caves.

TYPE –

54. Aquatic cave community -- Pools, streams, and waterfalls in caves provide habitat for this community. These waters are part of the groundwater in a region, and the water may come to the surface in springs and seeps. Distribution: This community occurs with terrestrial cave communities. Characteristic animals: There are many troglobitic (cave-adapted) aquatic invertebrates in Indiana caves including several species of amphipods and isopods. The *Ambleyopsis spelea* (blind cavefish) and *Orconectes inermis* (blind crayfish) inhabit some caves and springs.

55. Terrestrial cave community --This community occupies air-filled cavities in rock. Distribution: The substrate may be bedrock, cobbles, sand, mud or organic detritus. Characteristic animals: *Myotis lucifugus* (little brown bat), *Eptesicus fuscus* (big brown bat), *Pipistrellus subflavus* (eastern pipistrelle), *Eurycea lucifuga* (cave salamander).

SUBCLASS

Cliff – Cliff communities occur on or near vertical faces of exposed bedrock or unconsolidated materials. Soils are absent or very thin, and the plant communities are largely determined by the substrate. Aspect (the direction the cliff is facing) and amount of shade also are important. In Indiana there are four natural cliff communities: sandstone cliff, limestone cliff, sandstone overhang, and

eroding bluff communities. Cliffs can be broken into two types: dry cliff communities which generally face south to west and mesic cliffs which generally face north to east.

TYPE

56. Eroding cliff community--This community consists of vertical exposures of eroded unconsolidated material (for example, glacial drift) or weak rock (such as shale). The steep slope is maintained by stream or lake erosion, and the natural community is poorly developed because of continual slumping. Distribution: Eroding bluffs are most common along rivers in the glaciated part of Indiana. Characteristic plants: *Danthonia spicata* (curly grass), *Solidago nemoralis* (field goldenrod), *Taenidia integerrima* (yellow pimpernel).

57. Limestone cliff community.-- Limestone cliff communities are typically show a lesser resistance to weathering and a higher pH than sandstone cliffs. Distribution: Limestone cliffs occur mostly in southern Indiana, especially in the Highland Rim and Bluegrass Natural Regions. Characteristic plants: *Cystopteris bulbifera* (bladder fern), *Pellaea atropurpurea* (purple cliffbrake), *Pellaea glabella* (smooth cliffbrake).

58. Sandstone overhang community.--This is a small but distinct natural community which occurs when a sandstone cliff forms a shelter. The soil beneath the overhand may consist of sandy residuum or unweathered loess. Light intensities are low, and soil moisture ranges from dry to wet. Distribution: Sandstone overhangs large enough to consider as distinct natural communities are common in the Shawnee Hills, but are rare in the rest of the state. Characteristic plants: *Trichomanes boschianum* (filmy fern), *Dodecatheon frenchii* (French's shooting-star).

59. Sandstone cliff community.-- Sandstone cliffs large enough to be recognized as distinct communities are abundant in the Shawnee Hills Natural Region. Characteristic plants: *Dryopteris marginalis* (marginal fern), *Heuchera parviflora* (late alumroot), *Cheilanthes lanosa* (hairy lip fern).

SUBCLASS

Lake dune. Windblown and wave-deposited sands along the border of Lake Michigan form the substrate for the beach and foredune communities. These communities are maintained indefinitely at an early stage of succession by the substrate or by natural disturbance.

TYPE

60. *Lake dune* – Lake dune vegetation varies depending on the age and stability of the dune. Foredune communities are characterized by the beginnings of soil development. A fairly dense cover of low shrubs and grasses is present. There is some floristic overlap with dry sand prairie because of the substrate present. Backdune communities have better developed soil and tree establishment. Dominant plants: *Schizachyrium scoparium* (little bluestem), *Arctostaphylos uva-ursi* (bearberry), *Juniperus horizontalis* (trailing juniper). On backdunes, *Quercus velutinua* (black oak). Characteristic plants: *Juniperus communis* (common juniper).

SUBCLASS

Gravel wash. This community consists of relatively stable, vegetated areas of fragmented rock (gravel, boulders, etc.), as well as bedrock, that occurs within and bordering swiftly flowing bodies of

water in stream and river channels.

TYPE

61. *Gravel wash* -- Of particular interest here are those examples that possess mostly herbaceous vegetation of species that typically occur in prairie environments, or are endemic to the type. These areas are periodically scoured by floodwater, keeping tree growth to a minimum. Distribution: The significant examples of the type occur in southern Indiana, mostly in the Highland Rim, Shawnee Hills, and Bluegrass Natural Regions. Dominant Plants: *Andropogon gerardii* (big bluestem), *Cornus amomum* (silky dogwood). Characteristic Plants: *Baptisia australis* (blue indigo), *Coreopsis tripteris* (tall tickseed), *Hypericum sphaerocarpum* (round-fruited St. John's wort), *Carex torta* (twisted sedge).

Literature Cited

Illinois Natural Areas Inventory. March 2002 draft of the Illinois Natural Areas Inventory's Illinois Natural Community Classification System. Modified from: Illinois Department of Conservation Task Force on Biological Inventories; Becker, Carl (Chair), Bob Cottingham, Fran Harty, Mike Morin, Dick Rogers, Dick Thorn, Gregg Tichacek.

Homoya, M.A., D.B. Abrell, J.R. Aldrich, and T.W. Post. 1985. The Natural Regions of Indiana. Proceedings of the Indiana Academy of Science, Vol. 94, pp. 245-268.

USDA *Soil Survey Manual* (Soil Survey Staff, 1953)